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Sughrue Mion Zinn Macpeak & Seas PLLC
2100 Pennsylvania Avenue NW
Washington, DC 20037-3202

EXAMINER

GARTENBERG, EHUD

ART UNIT PAPER NUMBER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 27

Application Number: 09/492,749
Filing Date: January 27, 2000
Appellant(s): DUJARRIC, CHRISTIAN FRANCOIS MICHEL

Ronald Kimble
For Appellant

EXAMINER'S ANSWER

MAILED
OCT 10 2003
GROUP 3700

This is in response to the appeal brief filed September 22, 2003.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

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(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) *Summary of Invention*

The summary of invention contained in the brief is deficient because it attempts to water down the centrality of the fission-based nuclear reactor to the making and practice of the invention as a whole. The masking is effected by submitting a relatively detailed summary where the nuclear reactor component is listed as equally important among a multitude of other mundane prior art elements.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

(7) *Grouping of Claims*

Appellant's brief includes a statement that claims 14, 4-5, 6-8 do not stand or fall together with respect to the rejections in view of the prior art only, and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) *Claims Appealed*

A substantially correct copy of appealed claims 6-8 appears on page 1 of the Appendix to the appellant's brief. The minor errors are as follows: the present rephrasing of the claims, as amended in paper no. 9, filed December 10, 2001, only "streamlines" the claim language, without affecting any of the claimed limitations.

(9) Prior Art of Record

3173248	CURTIS	3-1965
4739200	OBERLY	4-1988

The White House, National Science and Technology Council, Fact Sheet National Space Policy 9/19/1966, Intersector Guidelines, (6) Space Nuclear Power.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 4-8 and 14 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter that is against public policy. The United States National Space Policy states *inter alia*, that "Space nuclear reactors will not be used in Earth orbit without specific approval by the President", see in The White House, National Science and Technology Council, Fact Sheet National Space Policy, 9/19/1996, Intersector Guidelines, (6) Space Nuclear Power. There is no indication on the record that such an approval was, or will be granted by the President or his

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designee to practice the present invention. In response to Applicant's argument filed 12/16/2002, it is noted that as of February 12, 2003, this policy has not been changed.

3. In response to Applicant's arguments filed 12/16/2003 that the Presidential approval is required only for Earth-orbiting nuclear reactors, and not for nuclear reactors used in escape trajectories, it is noted that in any space launch, earth orbit may occur as a result of malfunction during the ascending phase causing the vehicle not to reach escape velocity. Therefore any vehicle launched into space is liable to become Earth orbiting.

4. In further response to said arguments, the Examiner will not comment on the following issues, because they are beyond the scope of patent application prosecution and examination:

a) the prosecution history of any United States Patent; b) research and development performed anywhere in the world; c) international cooperation treaties.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 4-8, 14 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The nuclear core 18 and heat engine 19 of Fig. 1 are

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not enabled and they are essential to the practice of the invention, because they power and rotate all the propellant pumps 10, 14, 16 and electricity generator 11 which feeds the critical induction loop 4. Note that the Borowski article in Aerospace America of 7/1992 does not enable said nuclear-core/engine combination either, in spite of claim to the contrary in the present application on p. 12, ll. 25-32 and in the response filed December 10, 2001. Note that: 1) the prohibitive weight of nuclear power reactors and the associated safety devices makes them at this time unsuitable for flight applications. 2) In no specific place does Borowski refer to a known nuclear reactor that has ever been flown on a rocket, or tested in a simulated rocket environment as a flight-qualified hardware (see also Applicant's own admission on p. 7, l. 20 *et seq.*) The Borowski article is speculative in substance and cannot be relied upon as enabling the claimed propulsion device whose most critical component is the nuclear reactor.

The disclosure is also not enabling 1) how to make a Brayton cycle with a pressure ratio of 82.2 (p. 15, l. 15), and 2) the factor 0.2 on p. 17, l. 15 (denominator of the formula). Note that enabling of the invention does not refer to substituting speculative numbers in a formula, but actually teaching the apparatus that can produce and withstand said pressure and a temperature of 2000 K conditions in a flight environment using Helium. While in conventional jet engines the air may be heated to 2000 K in the combustor by combusting kerosene, in the present case the Helium, being a noble element, can be heated only by heat transfer, as Helium cannot combine and burn with any other substance. The present application does not enable a light, flight capable heat exchanger operating at temperatures higher than 2000K and at high

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pressure. The argument on p. 8, ll. 5-7 of the amendment filed 6/17/2002 that the Space Shuttle turbo-pumps deliver hydrogen at 426 bars is not relevant because said pumps are not part of a Brayton cycle, as in the present invention. Regarding the factor 0.2, the disclosure does not teach how this number was deduced or measured, or how the entire combination was made according to this number, and therefore this figure is also considered to be speculative. "Speculative" is used here in the sense of hypothetical figures of merit used routinely in engineering feasibility studies. The fact that certain critical values are assumed (or speculated) to be feasible does not necessarily make these values actually feasible or attainable in the real world. This rejection is maintained in light of the amendment filed 6/17/2002, and answer filed 12/16/2002, because there is nothing substantial in the accompanying explanations to actually enable how to make an engine having those attributes, for example the weight of the engine components and its accessories. The Examiner strongly disagrees with the statement on p. 6, ll. 6-7 that "the manner in which heat is generated is not material to the operation of the heat engine". In rocket propulsion in general, and in space application in particular, the manner in which heat is generated and dissipated is THE MOST IMPORTANT ASPECT to the operation of the heat engine.

In response to the amendment filed 6/17/2002, note the following: neither the Applicant nor his cited references actually teach how to make the nuclear reactor and the associated heat exchanger of the claimed propulsion device. On p. 4, ll. 15-17 of the amendment, Applicant specifically states that his reactor is significantly different from the NERVA technology. Therefore, the facts at this point are as follows: the NERVA

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program never produced a flight able engine (see Sutton and Ross, "Rocket Propulsion Elements" (1976), p. 519, I. 1.) and furthermore, the figures of merit quoted in both Sutton and Ross and in Cinnamon are at this point in time speculative. Applicant is arguing that his reactor (that is not enabled by the current disclosure anyway) has the same figures of merit (e.g., thrust-to-weight ratio) as the NERVA engine. Therefore, it can be logically deduced that the quoted figures of merit of the present non-enabled engine are a first speculation in a chain of dependent speculations, that are further derived from speculative figures of merit of the non-existing NERVA-derived engine (the second speculation in the chain of speculations), that furthermore is "quite different" from the one in the present invention (the third speculation in the chain of speculations).

In order to overcome this rejection, Applicant is suggested to indicate in very precise terms and locations the enablement of the making and use of the engine and the associated heat transfer equipment that rotates the high frequency electricity generator and pumps claimed in claim 14.

In response to Applicant's arguments filed 12/16/2002, p. 9, II. 15-16, the Examiner notes that nowhere in the disclosure there is an enabling teaching on how to make and use a particle bed reactor as part of a propulsion system that has a core temperature of 3000K and delivers 0.5MW per kilogram mass of weight. Also, the repeated reliance of the Applicant on the Cinnamon reference is not considered as enabling, because Cinnamon himself is not enabling and it lacks the specific teachings on how to make and use the NERVA project in an actual propulsion system

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environment. If the Applicant has enabling teachings on this matter, he should make them of record.

Specification

7. The disclosure is objected to because of the following informalities: the teaching on p. 9, ll. 25-26 of frequencies upwards of 10kHz does not agree with the teaching on p. 13, l. 30, of a frequency of 30,000 rpm, i.e., 500Hz. The explanation given on p. 8, ll. 1-10 of the response filed 12/10/2001 does not clarify the number of poles that Applicants intend to use in order to produce an alternating current of 60,000Hz from a rotor rotating at 500Hz. If an unusually large number of poles will be claimed, then the question will arise whether or not the circumference of the alternator can physically accommodate that many poles in the confined space available, which is an enablement issue. Note that the teaching on p. 13, ll. 30 *et seq.*, and in the response filed on 12/10/2001 on p. 8 first paragraph is not accurate because 60,000Hz are not of the same order of magnitude with 500Hz. The explanation given in the amendment filed 6/17/2002, that the numbers quoted are given by way of a possible embodiment still does not teach how to make and use the invention. Incidentally, how precisely the Applicant intends to produce an alternating current at 60,000Hz from a rotor rotating at 500Hz (a multiplier of 120!) still remains a mystery. This objection is maintained, because the amendment and explanations given in the response filed 12/16/2002 are not convincing, and not enabling either.

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8. The condition of the disclosure precludes a complete examination for lack of enablement, but to the extent that the invention can be understood, a search of prior art has been conducted and the following rejections have been made. Lack of rejection over the prior art should not be interpreted as allowable subject matter.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claim 14 is rejected under 35 U.S.C. 102(b) as being anticipated by Curtiss et al., 3,173,248 which teach the invention substantially as disclosed and as claimed: a propulsion device 10 having an injection chamber 22, a nozzle between said chamber and a diverging section (unnumbered), an inductive coil 12 connected to a high-frequency electricity generator 24-26, and a divergent section (unnumbered) downstream the loop. Note that the alternating current in coil 12 inherently heats the ejected gases, as disclosed and as claimed, the Curtiss apparatus necessitating cooling to keep the temperature of the structure within the permissible limits.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Curtiss as applied to claim 14 above, and further in view of Oberly 4,739,200, which teaches to generate high-voltage high-power electricity for aerospace applications (col. 1, ll. 48-50, and col. 2, ll. 46) by cooling (i.e., heat exchanging) the generator with liquid hydrogen (col. 1, l. 58 and col. 3, ll. 3-9). It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to cool the Curtiss generator with a propellant fluid as taught by Oberly, in order to produce high-voltage high-power electricity with minimum weight as taught by Oberly. Note that liquid hydrogen was conventionally used in LH2/LOX rocket engines at the time of the claimed invention (Oberly, Fig. 8, 40 and 52), and therefore the Oberly engine had two separate inlets, one for LH2 and the other for LOX.

Applicant's objection to the use of Oberly '200 as being non-analogous art is not convincing in light of Oberly's specific teaching to the contrary, i.e., Oberly's invention specifically being disclosed as applicable for aerospace applications on col. 2, l. 46.

13. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Curtiss in view of Oberly as applied to claim 5 above, and further in view of Applicant's own admission that at the time of the claimed invention it was known in the art to use nuclear cores for space propulsion applications, such as the NERVA program. It would have been obvious to one of ordinary skill in the art at the time of the claimed invention

to use a nuclear core in the Curtiss propulsion system and use said core for the electrical power generation, in order to extend the system's useful life. Note that pumps were conventionally used in the art at the time of the claimed invention to inject propellants, and that heat exchangers were also conventionally used in order to increasing the thermal efficiency of the propulsion apparatus and to keep the temperature of the walls within the permissible operational range.

Response to Past Arguments

14. Applicant's arguments filed 6/17/2002 and 12/16/2002 have been fully considered but they are not persuasive for reasons discussed in detail above.

15. In particular, it cannot be emphasized enough that the disclosure as a whole, examined in light of all the references of record, that many of them are speculative in nature in the sense that the authors do not produce concrete, actual, real-life evidence to support their assertions, is not enabling one of ordinary skill in the art how to make and use the invention.

(11) Response to Argument

It is believed that all of Applicants' arguments have been properly and pointedly addressed in the Final Rejection. However, a further focus is hereby given in order to sharpen the issues:

Rejection under 35USC101: MPEP 706.03 under the "UTILITY" sub-section, specifically provides for a rejection when the make or use of the invention is "against public policy". In this case it is the actual use of the invention for its stated and intended purpose that triggered the rejection. This rejection has nothing to do with Applicant's

right and freedom to make the claimed invention. It has to do with the fact that the federal government has issued specific policy guidelines wherein "Space Nuclear Reactors will not be used in Earth Orbit without specific approval of the President or his designee". The language is crystal clear, and mostly prohibitive. What is at stake here is the fact that in case of malfunction - before during or after its launch and/or activation, the nuclear reactor becomes in the best of cases a radiation bomb *a la Chernobyl*, and in the worst of cases an actual atomic/fission bomb. With regard to the orbital aspect of the use, all artificial satellites are bound to enter the earth's orbit, even during intra-planetary missions, where conventionally, gravity-assisted orbits are used in order to accelerate the spacecraft between two planets (one of which is the Earth), before initiating the critical rocket-operation that sends the craft to its desired destination.

Rejection under 35USC112, 1st paragraph: It is not known in the art to make a rocket motor with a nuclear reactor of the type disclosed, that will be light enough in order to produce more thrust than its own weight. This is the crux of the problem, like in any other flight application. The MINERVA engine never flew, and it could never fly because it was too heavy. The CINAMON project was a speculative project run by students at the University of Texas. If Applicants know how to make and use the claimed propulsion device, they should enable it in the disclosure, and not hide behind unsubstantiated claims that others either know how to make and use it, or are of the opinion that it can be done. Enablement goes to the core of patentability, and Applicant failed to satisfy it.

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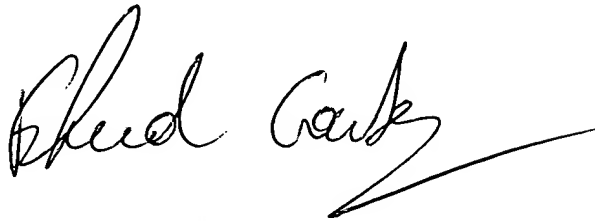
Rejection under 35USC102(b): The claimed invention claims "at least one loop" and as such it reads on the multiple loops of Curtis, for example the last loop providing added thrust in the remaining divergent portion of the nozzle up to his exhaust.

Applicant's claimed invention with multiple loops would look precisely like the Curtis engine. The induction heating of Curtis '248 is inherent in the use of any RF (i.e., Radio Frequency) power source like the one shown in Fig. 2, in a fashion that is similar to the operation of microwaves in any domestic household.

The rejections under 35USC103(a) are well documented above.

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

Ehud Gartenberg
Primary Examiner
Art Unit 3746

EG

October 9, 2003

Conferees



Louis Cassaregola

Primary Examiner



Charles Freay

Primary Examiner

Sughrue Mion Zinn Macpeak & Seas PLLC
2100 Pennsylvania Avenue NW
Washington, DC 20037-3202